SCANNED
1988.10

WHAT EVERY YOUNG HACKER SHOULD KNOW

ABOUT THE XANADU™ STORAGE AND PUBLISHING SYSTEM

Theodor Holm Nelson
Autodesk, Inc. & Project Xanadu
Contact also: Marc Stiegler, Head of Development, XOC, Inc., Palo Alto; 415/ 856-4112

Xanadu should be a vital and exciting part of everyone's computer experience, but fear, shame, ignorance and superstition have kept many people from enjoying a full and rewarding Xanadu life. It is to dispel this fear and ignorance, and present a liberating message of enlightenment to everyone still trapped in the old, inhibited way of thinking, that these notes are presented.

The Xanadu™ storage and publishing system is not just a hypertext or hypermedia system, though that is how it began. We have expanded and clarified its design to become tomorrow's universal storage mechanism for all data, all presentational media, and tomorrow's electronic publishing. Xanalogical storage (the generic term) is what hypertext and hypermedia will need in order to reach their fullest flowering. It is the manifest destiny of literature. We think you should understand why.

A GENERALIZED ADDRESS SPACE

We (actually Mark Miller and Roger Gregory) have designed a generalized address space for the specification of all data, residing on an arbitrarily-sized network of many connected machines. Tumblers are multipart integers with special mathematical properties (the inverse of transfinite arithmetic). A full address tumbler has four fields:

node /account...dept.../doct...version.../ byte or link no.

1.736.2.999.0.723.65.44.0.54.6.252.0.2.17 (2=byte)

The special power of tumbler addressing is that it can ADDRESS SPANS OF ANY SIZE, specifying spans of bytes, links, versions, documents and servers up to the entire docuverse of servers. The mathematical parsimony of this is illustrated as follows: to specify the entire docuverse of all servers as a span requires the starting tumbler of 1 and the difference tumbler of 1. Links connect spans. (Data types are also denoted by links.) Tumbler addressing can include data in other address spaces as a subset (and so we welcome your stored data in any form as a subset, provided the data are stable-- whether as frozen documents or in an incremental write-once editing modality like ours).

A GENERALIZED SERVER

To populate a substantial portion of this address space, we are creating high-power delivery software for the document servers of this network. This software will maintain, search and deliver anything that users want to create and follow, especially linked materials (hypertexts and hypermedia). We have developed algorithms with unique mathematical properties for efficient search and delivery service to interactive applications and users, searching on links and commonalities across this whole network. *These methods permit many nodes to unite and act as one, thus permitting documents and linkage structures to spread across the whole network.* These methods may also be ganged to serve many users, leveraging on their commonalities of user search; performance degradation is estimated to be highly favorable (loglike or square-root-like as the corpus and network expand).

Xanadu service is defined by the FEBE (Front End-Back End) protocol, and in principle "xanalike" servers enacting this protocol may be created by other means than ours. Xanadu ***front ends*** are application programs which use the Xanadu server. (over)

XOC, Inc., an Autodesk subsidiary, has announced delivery of the back-end storage software in 4Q89. That is our business. WE INVITE ALL INTERESTED DEVELOPERS TO BEGIN WORK ON FRONT-END PROGRAMS; LET THAT BE *YOUR* BUSINESS. Finalized protocol for the product (FEBE 89) will be specified in 1Q89. Contact XOC for developer and trademark support as you create Xanadu application software for any purpose.

A UNIVERSAL PUBLISHING NETWORK FOR HYPERMEDIA

Here's the payoff. We foresee a unifying storage and service network for tomorrow's publication, superseding paper in a powerful and elegant fashion sufficient for top researchers and decision makers but deliverable at high quality to a mass market (but far better than the lowgrade "videotext" systems condescendingly designed for mythical Joe Shmoe). Since the objects published in the future will be hypertexts and other hyperunits (arbitrarily structured systems of text, graphics, sound, fury, etc.), we mean to provide a smooth transition from linearity to a unifying, isotropic, cross-linked electronic literature. Royalty, paid automtically by the user as bytes are delivered, will motivate the creation and distribution of Fine and Important Work (as well as a lot of other material).

OPEN VERSUS CLOSED HYPERMEDIA

The naive view of hypermedia leads to enthusiasm for disconnected packages (especially on "CD-ROM"). But this threatens a new Balkanization: locked-in visualizations and interactive styles, noncombinable contents, barriers and tollbooths between sectors of material, new inflexibilities that are not in the tradition of western freedom. Books are compatible, may be viewed on the same desk. We cannot lose that.

The paramount issue now becomes **open hypermedia publishing--** creating a unified system in which links can be made WITHOUT permission, where quotations can be made WITHOUT permission, but with full credit and royalty to the owners. (See below.)

LINKAGE & COMMONALITY

A technical note. Nobody else has a linkage system like ours; we think it's what you need for all data and file handling, version management, CASE, and electronic publishing. The ideas are simple:

Data may co-reside in any number of documents,

because effectively there is only one big pool of data, and each document is a virtual structure which lists a subset. Not only can you go from each document to its contents, but you may go from any subset of contents to *all the documents containing parts of it.* Thus commonality provides bridges between all uses of the same material. Moreover,

Links are between spans of bytes.

This means that links survive editorial changes if bytes on each end are preserved. And it means that all links are in place in all versions. This means that all connections among versions are maintained automatically: both side-by-side comparison of commonality, and linkages which are alike between versions.

And this in turn has strong consequences for electronic publishing: it means that the same material may be conveniently used (by virtual copy) in many different documents, allowing freedom of revision and variation while preserving all the desirable features of copyright: credit, royalty, nothing misquoted and nothing out of context (because the original context is directly accessible). And pointers require no permission. Thus xanalogical storage is a paramount necessity for tomorrow's freedoms of access, speech and the press.

This has been yet another summary of the book ***Literary Machines*** *by Theodor Holm Nelson.*
(Edition 87.1 $25 from Ted Nelson, findable at various addresses.)

© 7 Oct 1988 Project Xanadu. Ynghack.d7